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GREAT BRITAIN

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION



Improvements in or relating to the Recording of Sound Tracks in Colour Film

We, Geoffrey Bond Harrison, a British Subject, and Ilford Limited, a British Company, both of 23. Roden Street, Ilford, in the County of Essex, do 5 hereby declare the nature of this invention to be as follows:—

This invention relates to colour photography and particularly to methods of colour photography using a multilayer photographic kine film wherein the processing of the layers of such film to form colour images therein involves the selective exposure of the layers, and is particularly concerned with the recording of 15 a sound track in such film.

One technique which has been proposed for the production of a kine colour film employs a multilayer film which includes in superposition, in order, light-sensitive silver halide emulsions sensitive to blue, green and red light respectively and, separating the emulsion layers from one another, yellow filter or "barrier" layers. The normal photographic emulsion is sensitive to blue light and the yellow filter layer which lies between the blue-sensitive layer and the green-sensitive layer serves to absorb blue light so that when the film is exposed in the camera the blue light of the subject does not record in the red- and green-sensitive layers.

In processing such a material it is usual to form colour images in colours which are subtractive with reference to the utilised sensitivities of the layers. Thus a yellow positive image is formed in the original blue-sensitive layer, a magenta positive image in the original 40 green-sensitive layer and a blue-green or "cyan" image in the original redsensitive layer. The production of such colour positive images where the support for the emulsion is colourless and trans-45 parent or translucent may be as follows:

After exposure in the camera the multi-

layer film is developed in a normal developer yielding negative silver images in the three emulsion layers. The bluesensitive layer is then re-exposed to blue 50 light and the effect of the exposing light is confined to the blue-sensitive layer by the yellow barrier layer lying behind it. This blue-sensitive layer is then processed to a positive yellow image. The red-sensi- 55 tive layer is then exposed to blue light passing through the support and again the action of the blue light is confined to the red-sensitive layer by the adjacent yellow barrier layer. The red-sensitive 60 layer is then processed to form a positive cyan image. In order to effect exposure of the middle layer which lies between the barrier layers, it has been proposed to use exposing light which is of such 65 wavelength as will penetrate the barrier layers. Thus, if the green-sensitivity of this layer has not been destroyed by the earlier treatments, it is practicable to effect exposure by means of green light. 70 Alternatively, the middle layer may be rendered developable by exposure to intense blue light, or by exposure to X-rays, or by chemical treatment, for example with a 5% aqueous solution of 75 sodium arsenite or hydrogen peroxide or gunnidine thiocyanate, and then developed to form a positive magenta image therein.

It is possible to record a sound track on 80 the film using white light, in which case the sound track will appear in the final film as a reversed track recorded in each of the three layers as dye images of the same colours as the picture images in the 85 respective layers. This method, however, is not wholly satisfactory and it is preferred that the sound track should be confined to a single layer, two layers, or all three layers of the material in a 90 dye selected with regard to the characteristics of the photo-cell to be used in

the reproduction, said dye not necessarily being one of the dyes used for a picture image.

The present invention is concerned with the use of a multilayer film comprising a support carrying three silver halide emulsion layers selectively sensitive to red, green and blue light (the red- and green-sensitive layers being in either 10 order but both on one side of the bluesensitive layer) and containing barrier layers (separating the emulsion layers) which have a substantial density to blue light. Such barrier layers may be 15 present in the material initially or may be formed in the material during its processing provided, however, that a blueabsorbing layer is present in the original multilaver film between the emulsion 20 intended to record the blue aspects of the subject photographed and the other emulsion layers.

In the present invention the picture record is obtained in such multilayer 25 film by developing the exposed film in a reversal photographic developer, selectively rendering the residual silver halide in the emulsion layers developable, and developing such layers by means of an 30 aromatic primary amino developing agent in the presence of colour-formers which couple with the oxidation products of such developing agent, formed during the development, to form quinone-imine 35 or azomethine dve images respectively subtractive in colour in relation to the utilised sensitivities of the respective emulsion layers.

In the preferred form of the invention 40 the colour-formers are included in the developing solutions, but the invention includes the possibility of one or more of the colour-formers being present in the emulsion layers (or in layers adjacent 45 thereto).

The order of the emulsions in the multilayer material is preferably bluesensitive, green-sensitive and red-sensitive, and the invention will be described 40 with particular reference to a multilayer material of this kind. If the order of the green- and red-sensitive layers is reversed, adjustments in the order of the processing steps become necessary

In accordance with the present invennon, in employing a multilayer film material as above defined and processing it to form colour picture images therein by the method above defined, a negative 60 sound track is recorded in the material (by direct exposure or by printing) so that it is recorded in one, two or all three of the emulsion layers, the sound track area only of the film is thereafter re-65 exposed to form a reversed image in one,

two or all three emulsion layers, and the reversed images thus obtained are colourdeveloped to form positive sound track images in dyestuff, the dyestuff sound track images thus formed, or at least one 70 of them, being in a dyestuff different from the dyestuff used for the picture area of the layer in which the said track is lucated.

Where any of the emulsion layers 75 initially contains a colour-former the colour development will usually produce some image in the sound track in the dvestuff which is derived from the colourformer present in such layer, which will 80 be the same dyestuff as is present in the associated picture area of that layer: in accordance with this invention, however, the colour development in such a case may be effected in the presence of a 85 different colour-former present in the developing solution so that the resulting track is formed of two dyestuffs, one of which is different from that used in the picture area.

The first sound track may be recorded or printed in any one, any two or all three layers by suitable choice of recording or exposing light. The final positive sound track may be confined to any one, any 95 two or all three of the layers by suitable choice of re-exposing light and within the limitation that the final record cannot exist in a layer in which the original sound track was not recorded. Accord- 100 ing to the stage of the processing at which the re-exposure or re-exposures of the sound track regions take place, the sound track or sound tracks may be produced by a single colour or a superposition of 105 two or more colours. It is the feature of this invention that at least one of these colours is different from the colour in which the sound track image in that layer would have been reproduced had 110 that sound track image been re-exposed and developed to colour simultaneously with the picture image in the same layer.

The following are examples of the various procedures which may be em- 115 ployed within the scope of the present invention. In these examples the multilayer material consists of:

(a) transparent or translucent colourless support. (b) silver halide emulsion layer sensitive to red light.

(c) a layer absorbing blue light and either present in the initial material or formed therein during 125 or immediately subsequent to the first development of the material.

(d) silver halide emulsion layer sensitive to green light.

(e) a layer similar to (c) which, if the 130

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626,727 3 the blue-absorbing characteristic urstep 10 causes the formation of a positive formed during or immediately лck magenta sound track in layer (f). subsequent to the first developand ment, also contains a blue-absorb-PROCEDURE V. ··ne 70 The procedure I is followed except that ing material which can be removed 5 om step 7 is effected before step 4, before step 70 or destroyed at any convenient οf 6, before step 9 or before step 11, and is stage in the processing. 18 followed immediately by colour-develop-(f) silver halide emulsion layer sensiment using any desired colour-former (i.e. not necessarily one used for any of tive to blue light. ers 75 For preference layers (c) and (e) are of the the picture areas) yielding a positive 75 the type described in Application No. ıce sound track in coloured dye in layer (f). 17544/45. : lie The assembly may contain other PROCEDURE VI. 11-1. Expose to a coloured subject. layers, e.g. an anti-halation layer and a ill 80 2. Expose sound area to record a nega-15 non-stress supercoat layer if desired. lie tive sound track, the exposure being by 80 PROCEDURE I. in, white layer and therefore giving an 1. Expose to a coloured subject. ٠r, image in all three emulsion layers. 2. Expose sound area to record a negaise 3. Develop in a non-colour-forming tive sound track, the exposure being by 85 a 20 blue light, thus confining the image to developer. lıе 4. Re-expose the picture area only of 85 layer (f). Hg (f) with blue light. 3. Develop in a non-colour-forming ο£ 5. Colour-develop layer (f) in a yellow developer. he colour developer. 4. Re-expose the picture area only of 25 (f) with blue light. 90 6. Re-expose the picture area of (b) ed with blue light passing through (a). 5. Colour-develop layer (f) in a yellow еe 7. Re-expose the sound track area only colour developer. or with white light. 6. Re-expose picture area only of ıď 8. Colour-develop (b) and the exposed bottom layer (b) with blue light passing ιV 95 sound track area with a cyan colour-30 through (a). le 7. Re-expose the sound track area only developer. ıe 9. Re-expose the picture area of (d) of (f) with blue light. ot from both sides with white light of suffi-8. Colour-develop (b) and sound track al cient intensity to penetrate layers (c) and of (f) in a cyan colour developer. 100 9. Re-expose picture area only of (e). ·lı 10. Colour-develop (d) with a magenta 100 middle layer (d) from both sides with blue 10 light of sufficient intensity to penetrate colour-developer. ·d 11. Remove silver and residual silver layers (c) and (e). ·d salts by treatment with Farmer's reducer. 10. Colour-develop (d) with a magenta ۰f 105 This procedure results in a product in 40 colour developer. ·e which there is a true colour record of the 105 11. Remove silver and residual silver ۰f original subject in the picture area and salts by treatment with Farmer's reducer. ır positive (i.e. reversed) This procedure results in a product in sound track images in superposition in layers (b), (d) which there is a true colour record of the ·l 110 45 original subject in the picture area and and (f), all in a cyan dyestuff. PROCEDURE VII. a positive (i.e. reversed) sound track The procedure VI is followed except image in cyan dye in the original bluethat the group of steps 6, 7 and 8 are sensitive layer. carried out before the group of steps 4 and PROCEDURE II. 115 The procedure I is followed except that 5. A similar product is obtained. 50 the group of steps 6, 7 and 8 are carried PROCEDURE VIII. out before the group of steps 4 and 5. The procedure VI is followed except that step 7 is effected before step 4, before A similar product is obtained. step 6, before step 9 or before step 11, PROCEDURE III. 120 and is followed immediately by colour The procedure I is followed except that development using any desired colour- 120 the original exposure step 2 is effected former, yielding superimposed positive with white light and the exposure steps sound tracks in layers (b), (d) and (f) in 6 and 9 are confined to the picture areas. any desired coloured dye. A similar product is obtained. 125 Various other combinations of the steps are permissible in accordance with 125 60 PROCEDURE IV The procedure I is followed except the invention. that step 8 is carried out immediately In some methods of processing to colour after step 6 and hence affects only layer it is preferred to remove the first formed (b). The operation of step 7 then re-· 130 65 exposes the sound track area of (f) and silver images before effecting the reexposures. In the present invention such 130

removal may be carried out if desired. The expressions "positive" and "negative" sound tracks used herein are to be understood as having the fol-5 lowing meaning: The form of the sound track required in the final positive colour film for projection is considered to be a

positive sound track, and a corresponding track in which the tone values are reversed is considered to be a negative 10 sound track.

Dated this 29th day of November, 1946. V. GALLAFENT, Chartered Patent Agent.

COMPLETE SPECIFICATION

Improvements in or relating to the Recording of Sound Tracks in Colour Film

We, GEOFFREY BOND HARRISON, a British Subject, and Ilrond LIMITED, a British Company, both of 23, Roden 15 Street, Ilford, in the County of Essex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following 20 statement:-

This invention relates to colour photography and particularly to methods of colour photography using a multilayer photographic kine film wherein the pro-25 cessing of the layers of such film to form colour images therein involves the selective exposure of the layers, and is particularly concerned with the recording of

a sound track in such film.

One technique which has been proposed for the production of a kine colour film employs a multilayer film which includes in superposition, in order, lightsensitive silver halide emulsions sensitive 35 to blue, green and red light respectively and, separating the emulsion layers from one another, yellow filter or "barrier" layers. The normal photographic emulsion is sensitive to blue light and the 40 yellow filter layer which lies between the blue-sensitive layer and the green-sensitive layer serves to absorb blue light so that when the film is exposed in the camera the blue light of the subject does 45 not record in the red- and green-sensitive

In processing such a material it is usual to form colour images in colours which are subtractive with reference to the 50 utilised sensitivities of the layers. Thus a yellow positive image is formed in the original blue-sensitive layer, a magenta positive image in the original greensensitive layer and a blue-green or 'cyan' image in the original redsensitive layer. The production of such colour positive images where the support for the emulsion is colourless and transparent or translucent may be as follows: 60 After exposure in the camera the multilayer film is developed in a normal

developer yielding negative silver images in the three emulsion layers. The bluesensitive layer is then re-exposed to blue light and the effect of the exposing light 65 is confined to the blue-sensitive layer by the yellow barrier layer lying behind it. This blue-sensitive layer is then processed to a positive yellow image. sensitive layer is then exposed to blue 70 The redlight passing through the support and again the action of the blue light is confined to the red-sensitive layer by the adjacent yellow barrier layer. The redsensitive layer is then processed to form 75 a positive cyan image. In order to effect exposure of the middle layer which lies between the barrier layers, it has been proposed to use exposing light which is of such wavelength as will penetrate the 80 barrier layers. Thus, if the green-sensitivity of this layer has not been destroyed by the earlier treatments, it is practicable to effect exposure by means of green light. Alternatively, the middle layer may be rendered develop-Alternatively, the 85 able by exposure to intense blue light, or by exposure to X-rays, or by chemical treatment, for example with a 5% aqueous solution of sodium arsenite or 90 hydrogen peroxide or guanidine thio-cyanate, and then developed to form a positive magenta image therein.

It is possible to record a sound track on the film using white light, in which 95 case the sound track will appear in the final film as a reversed track recorded in each of the three layers as dye images of the same colours as the picture images in the respective layers. This method, 100 however, is not wholly satisfactory and it is preferred that the sound track should be confined to a single layer, two layers, or all three layers of the material in a dye selected with regard to the charac- 105 teristics of the photo-cell to be used in the reproduction, said dye not necessarily being one of the dyes used for a picture image.

In Specification No. 528,433 a process 110 of producing a sound record in photo-

graphic : in develo with a gives rise 5 dye image

used in ta method m sound trac film wher 10 three cul-

areas. The prethe use of support (15 emulsion

red, green green-sensi order but seusitive 1 20 layers (set

which have light. So present in be formed 25 cessing pr

absorbing multilayer intended to subject pli-30 sion layers

In the record is oi by develor reversal p 35 tively ren halide in ti and develo

agent in 1 40 which coup of such de the develop azomethine tractive is

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45 utilised 😹 emulsion la In the p the colour-

developing 50 includes the the colouremulsion 1. thereto).

The order 55 layer mate tive, green and the inv particular material of

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images ie blueto blue g light 65 ver by hind it. ocessed. he redto blue 70 rt and is conby the he redo form 75 o effect ch lies 🤧 been hich is ate the 80 green-5 been 3, it is means , the **85** evelopsht, or emical a 5% tite or 90 ·: thioform a track which 95 in the uld in ges

graphic film is described which consists in developing a silver salt sound image with a dye-forming developer which gives rise to a substantially neutral grey 5 dye image which is opaque to the light used in the sound reproduction and this method may be employed to produce grey sound tracks in multilayer photographic film where the emulsion layers record 10 three colour images in their picture

The present invention is concerned with the use of a multilayer film comprising a support carrying three silver halide 15 emulsion layers selectively sensitive to red, green and blue light (the red- and green-sensitive layers being in either order but both on one side of the bluesensitive layer) and containing barrier 20 layers (separating the emulsion layers) which have a substantial density to blue Such barrier layers may be present in the material initially or may be formed in the material during its pro-25 cessing provided, however, that a blueabsorbing layer is present in the original multilayer film between the emulsion intended to record the blue aspects of the subject photographed and the other emul-30 sion layers.

In the present invention the picture record is obtained in such multilayer film by developing the exposed film in a reversal photographic developer, selec-35 tively rendering the residual silver halide in the emulsion layers developable, and developing such layers by means of an aromatic primary amino developing agent in the presence of colour-formers 40 which couple with the oxidation products of such developing agent, formed during the development, to form quinone-inine or azomethine dye images respectively subtractive in colour in relation to the 45 utilised sensitivities of the respective emulsion layers.

In the preferred form of the invention the colour-formers are included in the developing solutions, but the invention 50 includes the possibility of one or more of the colour-formers being present in the emulsion layers (or in layers adjacent thereto).

The order of the emulsions in the multi-55 layer material is preferably blue-sensitive, green-sensitive and red-sensitive, and the invention will be described with particular reference to a multilayer material of this kind. If the order of the 60 green- and red-sensitive layers is reversed, adjustments in the order of the processing steps become necessary.

In accordance with the present invention, in employing a multilayer silver 65 halide film material as above defined and

processing it to form colour picture images therein by the method above defined, a negative sound track is recorded and developed in the material (by direct exposure or by printing) so that it 70 is recorded and developed in one, two or all three of the emulsion layers, thereafter, as a step prior to, subsequent to, or intermediate between the steps of colour developing picture images in the 75 material, the sound track area only of the film is re-exposed to form a reversed image in one, two or all three emulsion layers, and the reversed images thus obtained are colour-developed to form 80 positive sound track images in coloured dyestuff, the dyestuff sound track images thus formed, or at least one of them, being in a colour different from the colour of the dyestuff used for the picture area 85 of the layer in which the said track is

It is to be understood that in referring to the sound track images being in a coloured "dyestuff, the use of dyestuffs 90 which give neutral grey images is excluded from the invention.

Where any of the emulsion layers initially contains a colour-former the colour development will usually produce 96 an image in the sound track in the dyestuff which is derived from the colourformer present in such layer, which will be the same dyestuff as is present in the associated picture area of that layer: in 100 accordance with this invention, however, the colour development in such a case may be effected in the presence of a different colour-former present in the developing solution so that the resulting track is 105 formed of two dyestuffs, one of which is of a different colour from that used in the picture area.

The first sound track may be recorded or printed in any one, any two or all three 110 layers by suitable choice of recording or exposing light. The final positive sound track may be confined to any one, any two or all three of the layers by suitable choice of re-exposing light and within 115 the limitation that the final record cannot exist in a layer in which the original sound track was not recorded. According to the stage of the processing at which the re-exposure or re-exposures 120 of the sound track regions take place, the sound track or sound tracks may be produced by a single colour or a superposition of two or more colours. It is the feature of this invention that ut least one 125 of these colours is different from the colour in which the sound track image in that layer would have been reproduced had that sound track image been re-

exposed and developed to colour simul- 130

3 PH-taneously with the picture image in the image in cyan dye in the original bluesame layer. The following are examples of the sensitive layer. various procedures which may be eml'rocedure II. ployed within the scope of the present The procedure I is followed except that invention. In these examples the multithe group of steps 6, 7 and 8 are carried '70 out before the group of steps 4 and 5. A layer material consists of: similar product is obtained. (a) transparent or translucent colourless support. PROCEDURE III. (b) silver halide emulsion layer sensi-The procedure I is followed except that .10 the original exposure step 2 is effected 75 tive to red light. with white light and the exposure steps (c) a layer absorbing blue light and 10 6 and 9 are confined to the picture areas. either present in the initial A similar product is obtained. material or formed therein during 15 or immediately subsequent to the PROCEDURE IV. The procedure I is followed except that 80 first development of the material. (d) silver halide emulsion layer sensistep 8 is carried out immediately after 15 step 6 and hence affects only layer (b). The operation of step 7 then re-exposes tive to green light. (e) a layer similar to (c) which, if the the sound track area of (f) and step 10 20 blue-absorbing characteristic is causes the formation of a positive 85 formed during or immediately subsequent to the first developmagenta sound track in layer (f). 20 ment, also contains a blue-absorb-PROCEDURE V. The procedure I is followed except that ing material which can be removed step 7 is effected before step 4, before step 25 or destroyed at any convenient 6, before step 9 or before step 11, and is 90 stage in the processing. followed immediately by colour-develop-(f) silver halide emulsion layer sensi-25 ment using any desired colour-former tive to blue light. (i.e. not necessarily one used for any of For preference layers (c) and (e) are 30 of the type described in Specification No. the picture areas) yielding a positive sound track in coloured dye in layer (f). 95 The assembly may contain other layers, PROCEDURE VI. 30 1. Expose to a coloured subject. e.g. an anti-halation layer and a non-2. Expose sound area to record a negastress supercoat layer if desired. tive sound track, the exposure being by Procedure I. white light and therefore giving an image 100 1. Expose to a coloured subject. in all three emulsion layers. 2. Expose sound area to record a nega-35 3. Develop in a non-colour-forming tive sound track, the exposure being by blue light, thus confining the image to developer. 4. Re-expose the picture area only of 40 layer (f). 3. Develop in a non-colour-forming (f) with blue light. 5. Colour-develop layer (f) in a yellow developer. 40 4. Re-expose the picture area only of colour-developer. 6. Re-expose the picture area of (b) (f) with blue light. with blue light passing through (a). 5. Colour-develop layer (f) in a yellow 7. Re-expose the sound track area only 110 colour developer. 6. Re-expose picture area only of bottom layer (b) with blue light passing with white light. 45 8. Colour-develop (b) and the exposed sound track area with a cyan colourthrough (a). 7. Re-expose the sound track area only developer. of (f) with blue light. 9. Re-expose the picture area of (d) 115 from both sides with white light of suffi-8. Colour-develop (b) and sound track 50 cient intensity to penetrate layers (c) and of (f) in a cyan colour developer. 9. Re-expose picture area only of 55 middle layer (d) from both sides with blue 10. Colour-develop (d) with a magenta light of sufficient intensity to penetrate colour-developer. 11. Remove silver and residual silver layers (c) and (e). 55 salts by treatment with Farmer's reducer. 10. Colour-develop (d) with a magenta This procedure results in a product in colour developer. which there is a true colour record of the 11. Remove silver and residual silver original subject in the picture area and 125 salts by treatment with Farmer's reducer. positive (i.e. reversed) sound track images This procedure results in a product in GO in superposition in luyers (b), (d) and (f), which there is a true colour record of the original subject in the picture area and all in a cyan dyestuff. 65 a positive (i.e. reversed) sound track PROCEDURE VII. The procedure VI is followed except 130 65

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that the group of steps 6, 7 and 8 are carried out before the group of steps 4 and 5. A similar product is obtained.

PROCEDURE VIII. The procedure VI is followed except that step 7 is effected before step 4, before step 6, before step 9 or before step 11, and is followed immediately by colour development using any desired colour-10 former, yielding superimposed positive sound tracks in layers (b), (d) and (f) in

any desired colour dye.

PROCEDURE IX. The procedure VI is followed except 15 that the re-exposure of step 6 is given to both picture and sound track area of (b) with blue light passing through (a). similar product is obtained.

PROCEDURE X. The procedure I is followed except that step 2 is carried out by giving an additional uniform exposure to red light so as to render that part of layer (b) in the sound track region developable, then 25 step 6 may be simplified in that the reexposure is given to the sound and picture areas instead of being restricted to the picture area.

PROCEDURE XI. The procedure I is followed except that step 2 is carried out by giving additional uniform exposures to red and green (or yellow) light so as to render those parts of layers (b) and (d) in the sound track 35 region developable, then steps 6 and 9 may be simplified in that the re-exposures are given to the sound and picture areas instead of being restricted to the picture

Various other combinations of the steps are permissible in accordance with the invention.

The invention will now be illustrated with reference to the following specific 45 Example: -

EXAMPLE.

A photographic multilayer element was prepared consisting of the following layers in superposition in the order stated. (a) Transparent colourless film sup-

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area.

(b) Gelatino silver iodobromide emulsion, sensitised to the red region of the spectrum by means of 2.21.8triethyl - 4.41 - dichloro-thiocarbocyanine bromide.

(c) Gelatin layer containing colloidal silver sulphide and silver halide (prepared as described below).

(d) Gelatino silver iodobromide emulsions, sensitised to the green region of the spectrum by means of 1.11 - diethyl - pseudocyanine

(e) Gelatin layer containing colloidal

siler sulphide and silver halide (pre ared as described below) and containing the dyestuff 1-p-sulphophenyl - 3 - methyl - 4 - cinnamylidene-pyrazole-5-one.

(f) Gelatino silver iodobromide emulsion having a natural sensitivity in the blue region of the spectrum and substantially insensitive to the green and red regions of the spec- 75

trum.

The layers (c) and (e) were prepared by adding to a 5% solution of gelatin, 5 cc. of M/100 silver nitrate solution and 2.5 cc. of M/100 thiouren solution per 80 100 cc. of gelatin solution, digesting at 120° F. for 60 minutes, and adding 10 cc. of fine grain silver iodobromide emulsion (containing 250 mgm. of silver) per 100 cc. of gelatin solution. In the case 85 of layer (e) a quantity of the stated dye equal to 5% on the weight of the gelatin was added.

The element thus prepared was exposed to a coloured object and the sound area 90 was exposed to record by blue light a. negative sound record, the light being incident on layer (f). It was then developed for 8 minutes in a developer of the following formula: -

Metol Sodium sulphite (anhydrous) - 50 Hydroquinone Sodium carbonate (anhydrous) 37.5 gms. Sodium thiocyanate - - 2 Potassium bromide gins.

Water to make - .l· This produced negative records in silver in layers (b), (d) and (f) corresponding to the red, green and blue aspects of 105 the object and in addition, produced a yellow-brown silver deposit in layers (c) and (e) and bleached the dyestuff in (e). The element was then washed in running water for 20 minutes and then processed 110 to give a full colour image in the follow-

ing stages :-1. Exposed the picture area only to the top layer (f) to blue light (not containing ultra-violet rays), the exposure being con- 115 fined to this layer by the barrier layer This exposure was made by means of a 125 watt high pressure mercury vapour lamp, the light from which passed through a blue filter substantially traus- 120 mitting radiations only in the region 400—450 nm of the spectrum (e.g. an Ilford filter No. 601). The word "Ilford" is a Registered Trade Mark. An exposure time of 10 seconds at one 125

foot distance was found sufficient. 2. This layer (f) colour-developed in a yellow colour developer of the following composition:-

N.N-diethyl p-phenylene di-

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| amine hydrochloride 0 1 cm | un sumitime / |
|--|--|
| amine hydrochloride - 0.4 gr Ethyl alcohol - 40 gn Sodium carbonate (Na ₂ CO ₃ .10H ₂ O) | m. positive (i.e. reversed) sound |
| Sodium carbonate (Na ₄ CO _{1.} 10H ₄ O) | is. in cyan dye in the originall tive layer. |
| 20% solution 160 ce | The five as it |
| 5 Sodium sulphite (Na ₂ SO _{1.7} II ₂ O) | The fine grain emulsion |
| 5 Sodium sulphite (Na ₂ SO ₃ .7H ₂ O) 20% solution 2:4-chloracetoacetanilide Potassium bromide | layers (c) and (e) was too sl |
| 2:4-chloracetoacetanilide - 0.4 cm | an image during the various. |
| Potassium bromide 0.1 gn Water to make 400 cc. | The process 1 11 1 |
| Water to make 400 cc. | 1. The process described exemplified in the foregoin |
| o. Washed for 10 minutes. | may be as 1:0 1. |
| 4. The picture area only in the | |
| outom layer (b) and the sound track onl | v Positive .il. 1 1:1 |
| or the top layer (t) were exposed to blu | # Corand to! |
| ugut (not containing ultra-violet rave) | wilous I I I methous |
| to exposures being confined to these layers h | v or observed the cas, c.g. by |
| means of the barrier lavers (c) and (c | \ T |
| respectively. These exposures were made | a it is soul 1 |
| by the same light source and filter com | - silver images before effective |
| bination as used in stage 1. 20 5. Colour-developed in a blue con- | |
| Total developed in interpretation | removal may be carried out if |
| colour developer of the following composition:— | * INO expressions " |
| | negative Sound tracks used |
| N.N-diethyl p-phenylene di- | to be understood as having th |
| 25 Ethyl alcohol 0.4 gm. | meaning: The form of the c |
| Sodium carbonate (Na ₂ CO ₃ .10H ₂ O) | required in the final positive |
| 20% solution - 100 | for projection is considered to |
| 20% solution - 160 cc. Sodium sulphite (Na ₂ SO ₃ .7H ₂ O) | tive sound track, and a cor |
| 20% solution 25 | track in which the tone value |
| 30 2.4-dichlor-a-naphthol | versed is considered to be |
| 20% solution 25 cc. 30 2.4-dichlor-a-naphthol - 0.4 gm. Potassium bromide 0.1 gm. Water to make 400 cc. | sound track. |
| Water to make 400 cc | Having now particularly des |
| 6. Washed for 10 minutes. | ascertained the nature of our |
| 7. The picture area only in the middle | tion and in what manner the |
| ob tayer (a) exposed from both sides to ultra- | be performed, we declare that claim is:— |
| violet rays which will benefrate the har- | |
| rier layers. This exposure was made by | 1. A process for the production |
| means of a 125 watt high pressure mer- | colour film containing bot records and sound track reco |
| cury vapour lamp, the light from which | comprises employing a multila |
| 40 passed through an ultra-violet transmit- | halide film material as he |
| ting filter which absorbed a high propor- | defined and processing it to fo |
| tion of visible light, e.g. Wood's glass. | picture images therein by the |
| An exposure time of 2 minutes at one foot | hereinbefore defined, recording |
| distance was found sufficient. | tive sound track in the material |
| 45 S. This layer colour-developed in a | exposure or by printing so that |
| magenta colour developer of the follow- | corded in one, two or all thr |
| ing composition: | emulsion layers, thereafter, a |
| N.N-diethyl p-phenylene di- | prior to, subsequent to, or int |
| amine hydrochloride 0.4 gm. | between the steps of colour-d |
| 50 Ethyl alcohol 40 cc. | picture images in the material |
| Sodium carbonate (Na ₂ CO ₃ ,10H ₂ O) | ing the sound track area of the |
| 20% solution 160 cc. Sodium sulphite (Na ₂ SO ₃ .7H ₂ O) | to form a reversed image in on |
| | all three emulsion lavers, colour |
| 20% solution 25 cc. 55 $1-p$ - nitrophenyl - 3 - methyl- | ing the reversed images thus ob |
| O-pyrazolone 0.8 gm. | form positive sound track in |
| Water to make | ayestuffs, and so selecting the |
| 9. Washed for 20 minutes. | formers employed or the sequence |
| 10. Fixed and bleached in Farmer's | colour development steps that |
| 60 reducer, removing all the silver and silver | stuff sound track images, or at |
| salts and (thus) the colour from layers (c) | of them, will be formed in a dr |
| and (e). | a colour different from the colou |
| 11. Washed for 20 minutes. | dyestuff used for the picture are |
| The full colour image of the original | layer in which the said track is |
| 65 object was themselve what it | 2. A process for the produ- |

d track image lly blue-sensi-

included in low to record 70 ious exposure

above and ng Example ways. For 75 the exposed may be pros other than dye toning

ing to colour first formed ing the revention such

f desired. tive 'and ed herein are he following sound track colour film 90 to be a posiorresponding ues are rea negative

scribed and said invensame is to at what we

duction of oth colour ords which layer silver ereinbefore 105 orm colour he method g a nega-d by direct at it is re- 110 ree of the as a step termediate developing l re-expos- 115 e film only ue, two or ır-developbtained to images in 120 e colourquence of the dye-least one yestuff of 125 ur of the ea of the located.

65 object was thereby obtained as well as a colour film containing both colour records 130

5

10

15

20

85

9.5

rack image blue-seusi-

ncluded in v to record 70 s exposure

bove and Example ays. For 75 e exposed ay be prother than tye toning

10

20

g to colour est formed the resultion such lesired. 85 e'' and herein are following and track olour film 90 be a posisponding sare renegative

ribed and id invenime is to what we

100 iction of colour ds which ver silver cinbefore 105 m colour method a negay direct it is re- 110 of the a step rmediate veloping "e-expos- 11**5** ilm only , two or developained to ages in 120 colourcuce of he dye-. cast one stuff of 125

of the conted.
tion of records 130

and sound track records which comprises employing a photographic element which consists of:

(a) transparent or translucent colourless support.

(b) silver halide emulsion layer sensitive to red light.

(c) a layer absorbing blue light and either present in the initial material or formed therein during or immediately subsequent to the first development of the material.

(d) silver halide emulsion layer sensitive to green light.

(e) a layer similar to (c) which, if the blue-absorbing characteristic is formed during or immediately subsequent to the first development, also contains a blue-absorbing material which can be removed

or destroyed at any convenient stage in the processing.

(f) silver halide emulsion layer sensitive to blue light,

and exposing and processing said element 25 in accordance with any one of Procedures I to XI hereinbefore set forth.

3. A process for the production of colour film containing both colour records and sound track records substan- 30 tially as described in the specific Example hereinbefore set forth.

4. Photographic elements containing both a picture record and a sound track record whenever produced by 35 the processes hereinbefore described and claimed.

Dated this 28th day of November, 1947.

V. GALLAFENT,
Chartered Patent Agent.

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